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May 2008

ENVIRONMENTAL SATELLITES

Polar-orbiting Satellite Acquisition Faces Delays; Decisions Needed on Whether and How to Ensure Climate Data Continuity

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May 2008

ENVIRONMENTAL SATELLITES

Polar-orbiting Satellite Acquisition Faces Delays; Decisions Needed on Whether and How to Ensure Climate Data Continuity

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Highlights

Highlights of GAO-08-518, a report to the Subcommittees on Energy and Environment and Investigations and Oversight, Committee on Science and Technology, House of Representatives

Why GAO Did This Study

The National Polar-orbiting Operational Environmental Satellite System (NPOESS) is a tri-agency acquisition—managed by the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), the Department of Defense (DOD), and the National Aeronautics and Space Administration (NASA)—that has experienced escalating costs, schedule delays, and technical difficulties. These factors led to a June 2006 decision to restructure the program by reducing the number of satellites and sensors, increasing estimated costs to $12.5 billion, and delaying the first two satellites by 3 to 5 years.

Among other objectives, GAO was asked to evaluate progress in restructuring the acquisition, assess the status of key program components and risks, and assess NASA's, NOAA's, and DOD's plans for obtaining the data originally planned to be collected by NPOESS sensors, but eliminated by the restructuring. To do so, GAO analyzed program and contractor data, attended program reviews, and interviewed agency officials.

What GAO Recommends

GAO recommends that Commerce, NASA, and DOD coordinate to develop plans on whether and how to restore climate and space weather sensors removed from the NPOESS program. GAO is also reemphasizing a prior recommendation for agency executives to finalize acquisition documents. Agency officials agreed with both recommendations.

To view the full product, including the scope and methodology, click on GAO-08-518. For more information, contact David Powner at (202) 512-9286 or pownerd@gao.gov.

What GAO Found

The program office has completed most of the major activities associated with restructuring the NPOESS acquisition, but key activities remain to be completed. In the past year, the program redefined the program's deliverables, costs, and schedules, and renegotiated the NPOESS contract. However, agency executives have not yet finalized selected acquisition documents (including the tri-agency memorandum of agreement). Without the executive approval of key acquisition documents, the program lacks the underlying commitment needed to effectively manage a tri-agency program.

Over the past year, the NPOESS program has continued to make progress in completing development activities, but key milestones have been delayed and multiple risks remain. Specifically, poor workmanship and testing delays caused an 8-month slip in the expected delivery of a technologically complex imaging sensor that is critical to weather and climate observations. This later delivery caused a corresponding 8-month delay in the expected launch date of a demonstration satellite, called the NPOESS Preparatory Project (NPP). This demonstration satellite is intended to provide on-orbit experiences that can be used to reduce risks on NPOESS satellites and to provide interim weather and climate observations should predecessor weather and climate satellites begin to degrade or fail. Moving forward, risks remain in completing the testing of key sensors, integrating them on the NPP spacecraft, and ensuring sufficient system security. The program office is aware of these risks and is working to mitigate them, but continued problems could affect the program's overall schedule and cost.

When the NPOESS restructuring decision removed four climate and space environment sensors from the program and reduced the functionality of four others, the program was directed to restore a limited version of one sensor and to restore the seven others if funded by entities outside the program office. NOAA, NASA, and DOD have taken preliminary steps to restore the capabilities of selected sensors by prioritizing the sensors, assessing options for restoring them, and making decisions to mitigate near-term data gaps by adding two sensors to the NPP satellite. However, the agencies have not yet developed plans to mitigate the loss of these and other sensors on a long-term basis. Until such a plan is developed, the agencies may lose windows of opportunity for selecting cost effective options or they may resort to an ad hoc approach to restoring these sensors. Almost 2 years have passed since key sensors were removed from the NPOESS program; further delays in establishing a plan could result in gaps in the continuity of climate and space environment data.

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Abbreviations

CrIS	Cross-track infrared sounder
DMSP	Defense Meteorological Satellite Program
DOD	Department of Defense
EDR	environmental data record
IDPS	interface data processing system
NASA	National Aeronautics and Space Administration
NESDIS	National Environmental Satellite, Data, and Information Service
NOAA	National Oceanic and Atmospheric Administration
NPOESS	National Polar-orbiting Operational Environmental Satellite System
NPP	NPOESS Preparatory Project
POES	Polar-orbiting Operational Environmental Satellites
VIIRS	Visible/infrared imager radiometer suite

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United States Government Accountability Office
Washington, DC 20548

May 16, 2008

The Honorable Nick Lampson
Chairman
The Honorable Bob Inglis
Ranking Member
Subcommittee on Energy and Environment
Committee on Science and Technology
House of Representatives

The Honorable Brad Miller
Chairman
The Honorable F. James Sensenbrenner Jr.
Ranking Member
Subcommittee on Investigations and Oversight
Committee on Science and Technology
House of Representatives

The planned National Polar-orbiting Operational Environmental Satellite System (NPOESS) program is expected to be a state-of-the-art, environment-monitoring satellite system that will replace two existing polar-orbiting environmental satellite systems. Polar-orbiting satellites provide data and imagery that are used by weather forecasters, climatologists, and the military to map and monitor changes in weather, climate, the oceans, and the environment. The NPOESS program is considered critical to the United States' ability to maintain the continuity of data required for weather forecasting (including severe weather events such as hurricanes) and global climate monitoring through the year 2026.

Three agencies share responsibility for the NPOESS acquisition: the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), the Department of Defense (DOD)/United States Air Force, and the National Aeronautics and Space Administration (NASA). These agencies established a tri-agency integrated program office to manage the NPOESS program. In recent years, this program experienced escalating costs, schedule delays, and technical difficulties, leading to a June 2006 decision to restructure the program. This decision decreased the complexity of the program by reducing the number of satellites and sensors, increased the estimated cost of the program to $12.5 billion, and delayed the launches of the first two satellites by 3 to 5 years. The launch of a demonstration satellite, called the NPOESS Preparatory

Project (NPP), was also delayed by about 3 years. NPP is expected to reduce NPOESS risks by providing an early opportunity to work with the sensors, ground systems, and data processing systems. It is also envisioned to provide continuity of weather and climate data should predecessor satellites degrade or fail. In addition, when the restructuring decision removed four climate and space environment sensors from the program and reduced the functionality of four others, the program was directed to restore a limited version of one sensor and to restore the seven others if sponsored and funded outside the program.

This report responds to your request that we (1) evaluate the NPOESS program office's progress in restructuring the acquisition, (2) assess the status of key program components and risks, (3) identify how much notice the program office would need if agency sponsors outside the program choose to restore the eliminated or degraded sensors to the NPOESS program, and (4) assess NASA's, NOAA's, and DOD's plans for obtaining the environmental data originally planned to be collected by NPOESS sensors, but then eliminated by the restructuring.

To address our objectives, we reviewed program documentation including the decision memo that restructured the program, status briefings, milestone progress reports, and reports on program and agency plans for restoring sensors to the NPOESS program. We analyzed earned value management data obtained from the contractor to determine performance against cost and schedule estimates. We also interviewed relevant agency officials from NOAA, NASA, and DOD. In addition, this work builds on

reviews we have done on environmental satellites over the last several years.[1]

We conducted our work at the NPOESS Integrated Program Office headquarters and at NOAA, NASA, and DOD facilities in the Washington, D.C., metropolitan area. In addition, we conducted work at a contractor's facility in Boulder, Colorado, and at the Air Force Weather Agency in Omaha, Nebraska, because of the importance of these sites to the planned integration and operations of the NPP satellite. We conducted this performance audit from June 2007 to April 2008 in accordance with generally accepted government auditing standards. Additional details on our objectives, scope, and methodology are provided in appendix I.

Results in Brief

The NPOESS program office has completed most of the major activities associated with restructuring the acquisition, but key activities remain to be completed. In the past year, the program redefined the program's deliverables, costs, and schedules, and renegotiated the NPOESS contract. However, agency executives have not yet finalized selected acquisition documents, including the tri-agency memorandum of agreement and the acquisition program baseline. Without executive approval of the memorandum of agreement and other key acquisition documents, the program lacks the underlying commitment needed to effectively manage a tri-agency program.

In the past year, the NPOESS program has made progress in completing development and testing activities associated with the spacecraft, sensors,

[1]GAO, *Environmental Satellite Acquisitions: Progress and Challenges*; GAO-07-1099T (Washington, D.C.: July 11, 2007); *Polar-orbiting Operational Environmental Satellites: Restructuring Is Under Way, but Challenges and Risks Remain*, GAO-07-910T (Washington, D.C.: June 7, 2007); *Polar-orbiting Operational Environmental Satellites: Restructuring Is Under Way, but Technical Challenges and Risks Remain*, GAO-07-498 (Washington, D.C.: Apr. .27, 2007); *Polar-orbiting Operational Environmental Satellites: Cost Increases Trigger Review and Place Program's Direction on Hold*, GAO-06-573T (Washington, D.C.: Mar. 30, 2006); *Polar-orbiting Operational Environmental Satellites: Technical Problems, Cost Increases, and Schedule Delays Trigger Need for Difficult Trade-off Decisions*, GAO-06-249T (Washington, D.C.: Nov. 16, 2005); *Polar-orbiting Environmental Satellites: Information on Program Cost and Schedule Changes*, GAO-04-1054 (Washington, D.C.: Sept. 30, 2004); *Polar-orbiting Environmental Satellites: Project Risks Could Affect Weather Data Needed by Civilian and Military Users*, GAO-03-987T (Washington, D.C.: July 15, 2003); and *Polar-orbiting Environmental Satellites: Status, Plans, and Future Data Management Challenges*, GAO-02-684T (Washington, D.C.: July 24, 2002).

and ground systems. However, key milestones have been delayed and multiple risks remain. Specifically, poor workmanship and testing delays caused an 8-month slip in the delivery of a complex imaging sensor called the Visible/infrared imager radiometer suite (VIIRS). This late delivery caused a corresponding 8-month delay in the expected launch date of the NPP demonstration satellite, moving it from late September 2009 to early June 2010. Any delay in this launch date shortens the time available for identifying lessons learned from NPP while it is in orbit and incorporating these lessons in the development of the first NPOESS satellite. NPP delays could also lead to gaps in weather and climate data continuity if existing satellites begin to degrade or fail. Moving forward, risks remain in completing the testing of key sensors and integrating them on the NPP spacecraft, resolving interagency disagreements about the appropriate level of system security, and revising outdated operations and support cost estimates. The program office is aware of these risks and is working to mitigate them, but continued problems could affect the program's overall schedule and cost.

When the NPOESS restructuring decision removed and degraded climate and space weather sensors from the program in order to reduce the risk and complexity of the system, it allowed for the sensors to be restored if funded by entities outside the program office. The NPOESS program office has requested that any entities that are willing to fund efforts to restore a sensor provide them 6 years' advance notice before the launch of the target satellite. This includes 4 years for the sensor to be developed and tested, and 2 years for integration and testing on the spacecraft. These milestones are based on historical data about how long it takes to build and integrate sensors. However, agency officials believe that these time frames could be shorter if the sensor has already been developed and the technology is well understood.

NASA, NOAA, and DOD have taken preliminary steps to restore the capabilities of selected climate and space weather sensors that were removed from the NPOESS program by prioritizing the sensors, assessing options for restoring them, and making decisions to mitigate near-term data continuity needs by restoring two sensors to the NPP satellite. However, the agencies have not yet developed plans on whether and how to replace sensors on a long-term basis. Until such a plan is developed, the agencies may lose their windows of opportunity for selecting cost-effective options or they may resort to an ad hoc approach to restoring these sensors. Almost 2 years have passed since key sensors were removed from the NPOESS program; further delays in establishing a plan could result in gaps in the continuity of climate and space data.

We are making recommendations to the Secretaries of Commerce and Defense and to the Administrator of NASA to coordinate with partner agencies to develop plans on whether and how to restore the climate and space weather sensors removed from the NPOESS program. In addition, we are reemphasizing our prior recommendation that the appropriate executives immediately finalize key acquisition documents. The Department of Commerce, DOD, and NASA provided written comments on a draft of our report (see apps. III, IV, and V). All three agencies agreed with our recommendations.

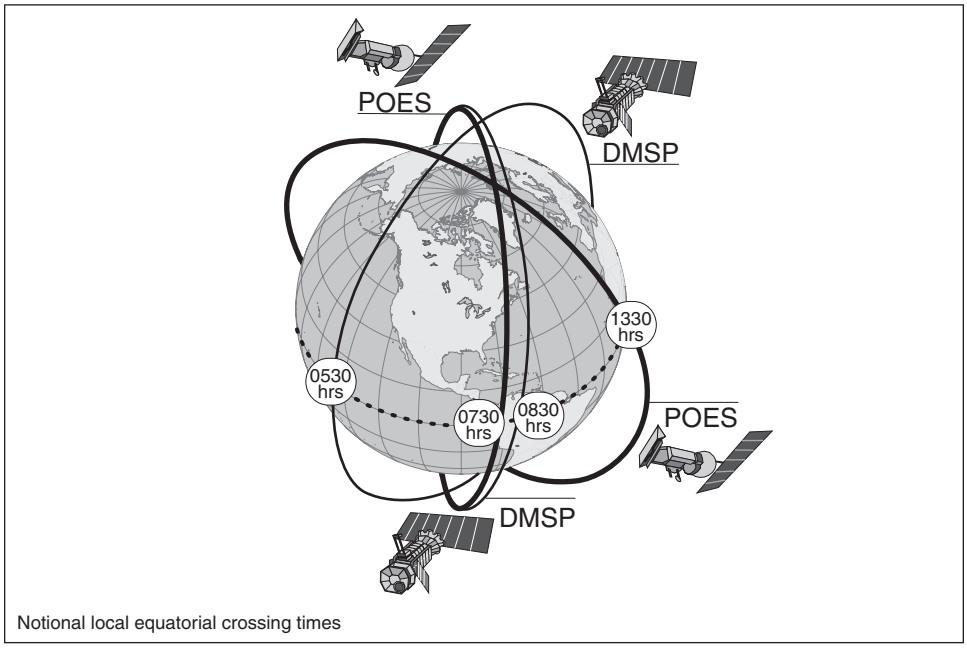
Background

Since the 1960s, the United States has operated two separate operational polar-orbiting meteorological satellite systems: the Polar-orbiting Operational Environmental Satellite (POES) series, which is managed by NOAA, and the Defense Meteorological Satellite Program (DMSP), which is managed by the Air Force. These satellites obtain environmental data that are processed to provide graphical weather images and specialized weather products. These satellite data are also the predominant input to numerical weather prediction models, which are a primary tool for forecasting weather 3 or more days in all advance—including forecasting the path and intensity of hurricanes. The weather products and models are used to predict the potential impact of severe weather so that communities and emergency managers can help prevent and mitigate their effects. Polar satellites also provide data used to monitor environmental phenomena, such as ozone depletion and drought conditions, as well as data sets that are used by researchers for a variety of studies such as climate monitoring.

Unlike geostationary satellites, which maintain a fixed position relative to the earth, polar-orbiting satellites constantly circle the earth in an almost north-south orbit, providing global coverage of conditions that affect the weather and climate. Each satellite makes about 14 orbits a day. As the earth rotates beneath it, each satellite views the entire earth's surface twice a day. Currently, there are two operational POES satellites and two operational DMSP satellites that are positioned so that they can observe the earth in early morning, midmorning, and early afternoon polar orbits. Together, they ensure that, for any region of the earth, the data provided to users are generally no more than 6 hours old. Figure 1 illustrates the current operational polar satellite configuration. Besides the four operational satellites, six older satellites are in orbit that still collect some data and are available to provide limited backup to the operational satellites should they degrade or fail. In the future, the Air Force plans to continue to launch an additional DMSP satellite every few years; the last is

currently expected to launch in 2012.[2] NOAA plans to launch the final remaining POES satellite in 2009.

Figure 1: Configuration of Operational Polar Satellites



Source: GAO, based on NPOESS Integrated Program Office data.

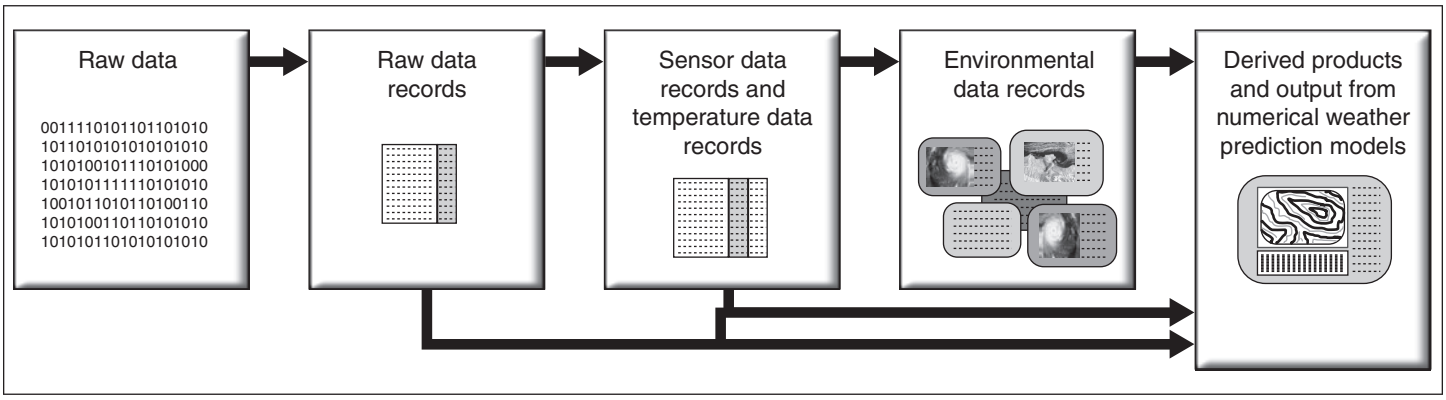
Polar Satellite Data and Products

Polar satellites gather a broad range of data that are transformed into a variety of products. Satellite sensors observe different bands of radiation wavelengths, called channels, which are used for remotely determining information about the earth's atmosphere, land surface, oceans, and the space environment. When first received, satellite data are considered raw data. To make them usable, the processing centers format the data so that they are time-sequenced and include earth location and calibration information. After formatting, these data are called raw data records. The centers further process these raw data records into channel-specific data sets, called sensor data records and temperature data records. These data records are then used to derive weather and climate products called environmental data records (EDR). EDRs include a wide range of

[2]Three DMSP satellites remain to be launched. DOD has the option of delaying the launch of the final DMSP satellite until 2016 if it is needed to extend coverage in a different orbit.

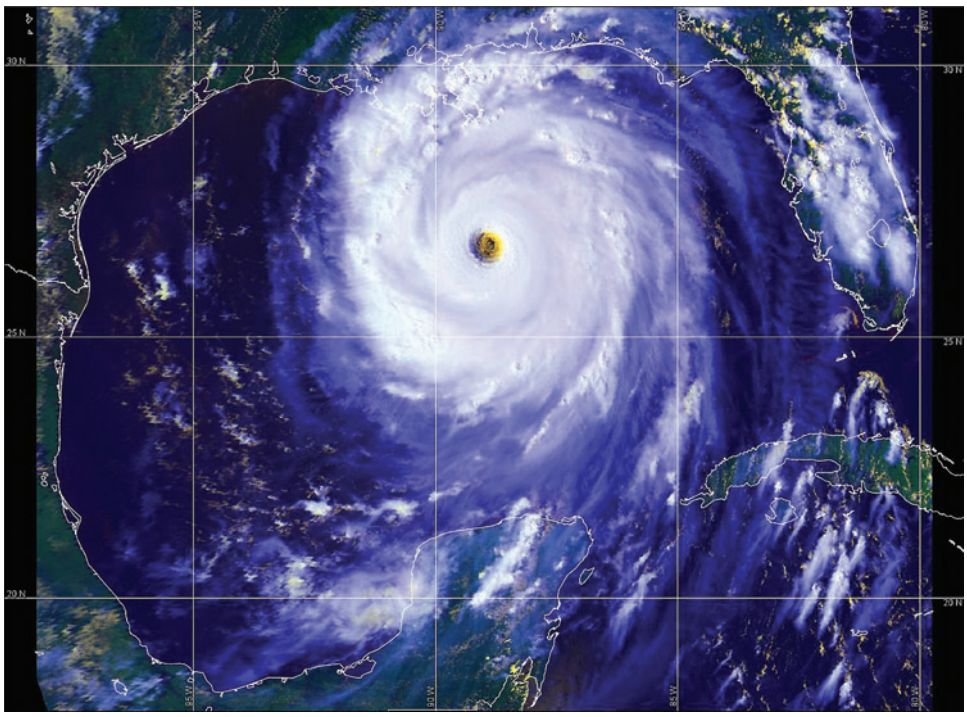
atmospheric products detailing cloud coverage, temperature, humidity, and ozone distribution; land surface products showing snow cover, vegetation, and land use; ocean products depicting sea surface temperatures, sea ice, and wave height; and characterizations of the space environment. Combinations of these data records (raw, sensor, temperature, and environmental data records) are also used to derive more sophisticated products, including outputs from numerical weather models and assessments of climate trends. Figure 2 is a simplified depiction of the various stages of satellite data processing, and figures 3 and 4 depict examples of EDR weather products. Specifically, figure 3 depicts a product used in weather forecasting, and figure 4 depicts a product used in climate monitoring. Figure 5 depicts a derived product that demonstrates how climate measurements can be aggregated over time to identify long-term trends. In commenting on a draft of this report, NOAA officials noted that while EDRs can be a valuable source of climate data, the scientific community also needs climate data records. These records require their own algorithms, data handling systems, and calibration/validation in order to ensure consistency in processing and reprocessing over years and decades.

Figure 2: Satellite Data Processing Steps



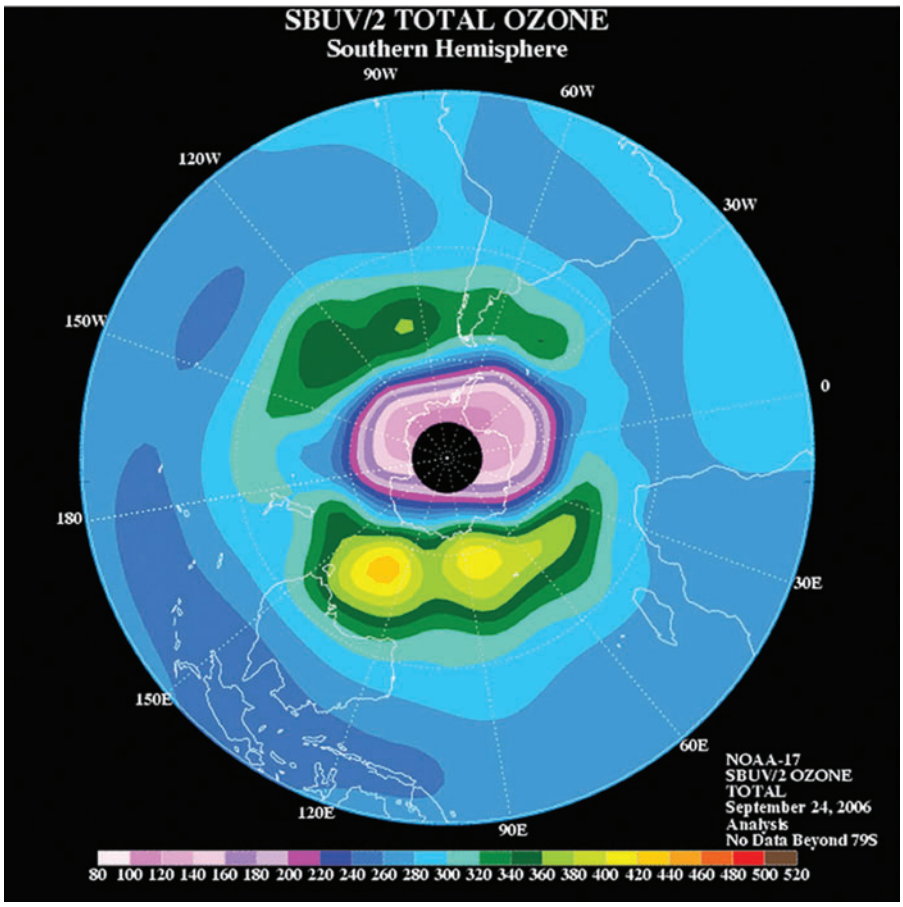
Source: GAO analysis of NOAA information.

Figure 3: POES Image of Hurricane Katrina in 2005



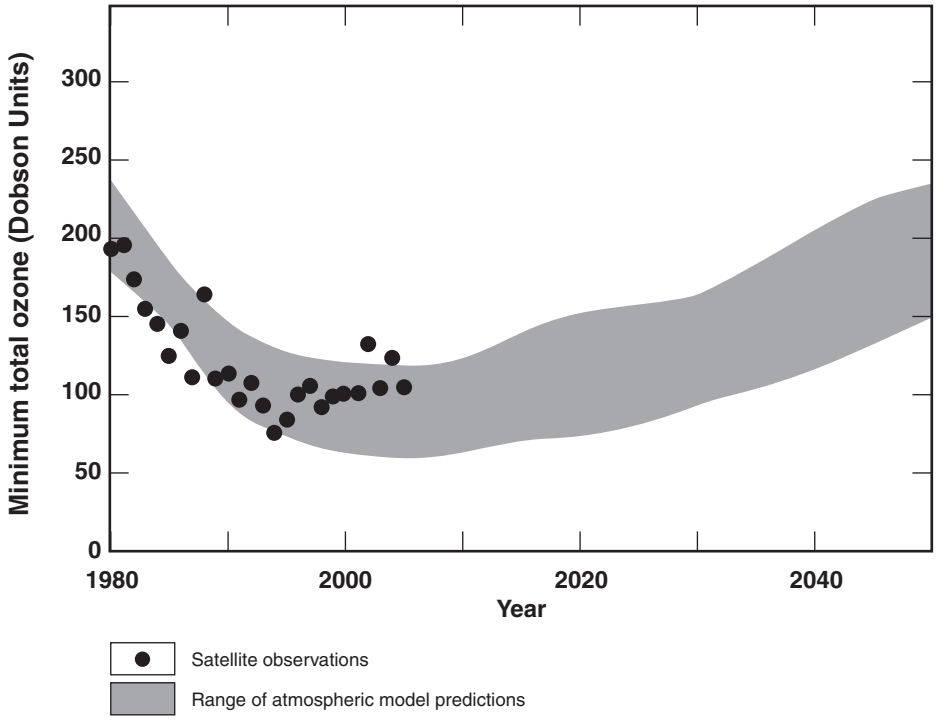
Source: NOAA's National Environmental Satellite, Data, and Information Service.

Figure 4: Analysis of Ozone Concentration from POES Satellite Data



Source: NOAA's National Environmental Satellite, Data, and Information Service.

Figure 5: Satellite Measurements of Ozone over Antarctica, from 1980 to 2005



Source: Fahey, D.W. (Lead Author), Twenty Questions and Answers About the Ozone Layer: 2006 Update, World Meteorological Organization, Geneva, 2007. [Reprinted from Scientific Assessment of Ozone Depletion: 2006, Global Ozone Research and Monitoring Project - Report No.50, World Meteorological Organization, Geneva, 2007.].

NPOESS Overview

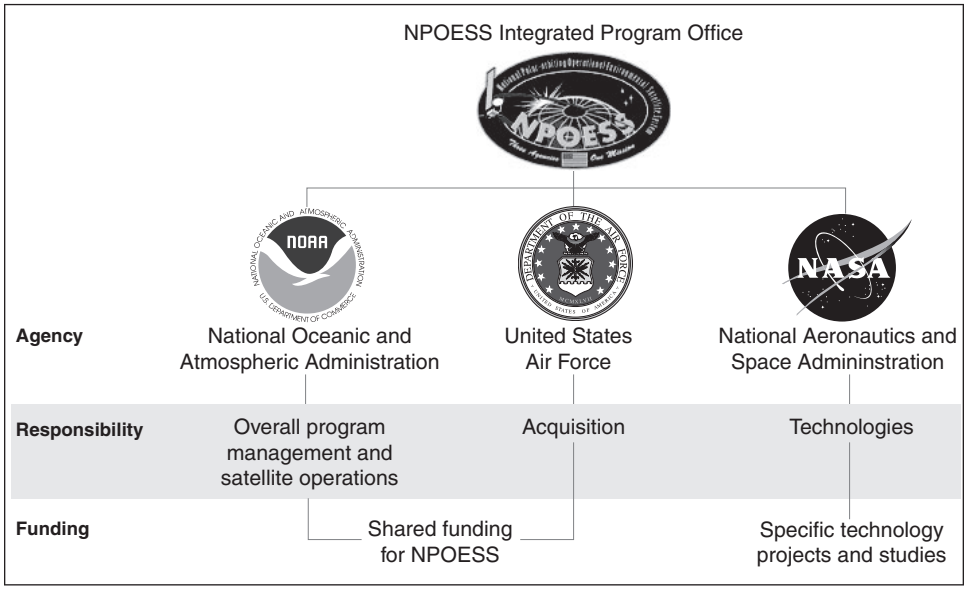
With the expectation that combining the POES and DMSP programs would reduce duplication and result in sizable cost savings, a May 1994 Presidential Decision Directive required NOAA and DOD to converge the two satellite programs into a single satellite program capable of satisfying both civilian and military requirements.[3] The converged program, NPOESS, is considered critical to the United States' ability to maintain the continuity of data required for weather forecasting and global climate monitoring through the year 2026. To manage this program, DOD, NOAA, and NASA formed the tri-agency Integrated Program Office, located within NOAA.

[3]Presidential Decision Directive NSTC-2, May 5, 1994.

Within the program office, each agency has the lead on certain activities: NOAA has overall program management responsibility for the converged system and for satellite operations; DOD's Air Force has the lead on the acquisition; and NASA has primary responsibility for facilitating the development and incorporation of new technologies into the converged system. NOAA and DOD share the costs of funding NPOESS, while NASA funds specific technology projects and studies. Figure 6 depicts the organizations that make up the NPOESS program office and lists their responsibilities.

The NPOESS program office is overseen by an executive committee that is made up of the administrators of NOAA and NASA and the Undersecretary of the Air Force.

Figure 6: Agency Responsibilities within the NPOESS Integrated Program Office



Source: GAO, based on NPOESS Integrated Program Office data.

NPOESS is a major system acquisition that was originally estimated to cost about $6.5 billion over the 24-year life of the program from its inception in 1995 through 2018. The program is to provide satellite development, satellite launch and operation, and ground-based satellite data processing. These deliverables are grouped into four main categories: (1) the space segment, which includes the satellites and sensors; (2) the integrated data processing segment, which is the system for transforming raw data into EDRs and is to be located at the four processing centers; (3)

the command, control, and communications segment, which includes the equipment and services needed to support satellite operations; and (4) the launch segment, which includes the launch vehicle services.

When the NPOESS engineering, manufacturing, and development contract was awarded in August 2002, the cost estimate was adjusted to $7 billion. Acquisition plans called for the procurement and launch of six satellites over the life of the program, as well as the integration of 13 instruments—consisting of 10 environmental sensors and 3 subsystems. Together, the sensors were to receive and transmit data on atmospheric, cloud cover, environmental, climatic, oceanographic, and solar-geophysical observations. The subsystems were to support nonenvironmental search and rescue efforts, sensor survivability, and environmental data collection activities. The program office considered 4 of the sensors to be critical because they provide data for key weather products; these sensors are in bold in table 1, which describes each of the expected NPOESS instruments.

Table 1: Expected NPOESS Instruments, as of August 31, 2004 (critical sensors are in bold)

Instrument	Description
Advanced technology microwave sounder	Measures microwave energy released and scattered by the atmosphere and is to be used with infrared sounding data from the cross-track infrared sounder to produce daily global atmospheric temperature, humidity, and pressure profiles
Aerosol polarimetry sensor	Retrieves specific measurements of clouds and aerosols (liquid droplets or solid particles suspended in the atmosphere, such as sea spray, smog, and smoke)
Conical-scanned microwave imager/sounder	Collects microwave images and data needed to measure rain rate, ocean surface wind speed and direction, amount of water in the clouds, and soil moisture, as well as temperature and humidity at different atmospheric levels
Cross-track infrared sounder	Collects measurements of the earth's radiation to determine the vertical distribution of temperature, moisture, and pressure in the atmosphere
Data collection system	Collects environmental data from platforms around the world and delivers them to users worldwide
Earth radiation budget sensor	Measures solar short-wave radiation and long-wave radiation released by the earth back into space on a worldwide scale to enhance long-term climate studies
Ozone mapper/profiler suite	Collects data needed to measure the amount and distribution of ozone in the earth's atmosphere. Consists of two components (limb and nadir), which can be provided separately

Instrument	Description
Radar altimeter	Measures variances in sea surface height/topography and ocean surface roughness, which are used to determine sea surface height, significant wave height, and ocean surface wind speed and to provide critical inputs to ocean forecasting and climate prediction models
Search and rescue satellite aided tracking system	Detects and locates aviators, mariners, and land-based users in distress
Space environmental sensor suite	Collects data to identify, reduce, and predict the effects of space weather on technological systems, including satellites and radio links
Survivability sensor	Monitors for attacks on the satellite and notifies other instruments in case of an attack
Total solar irradiance sensor	Monitors and captures total and spectral solar irradiance data
Visible/infrared imager radiometer suite (VIIRS)	Collects images and radiometric data used to provide information on the earth's clouds, atmosphere, ocean, and land surfaces

Source: GAO, based on NPOESS program office data.

In addition, a demonstration satellite, called the NPOESS Preparatory Project (NPP), was planned to be launched several years before the first NPOESS satellite in order to reduce the risk associated with launching new sensor technologies and to ensure continuity of climate data with NASA's Earth Observing System satellites. NPP was to host three of the four critical NPOESS sensors, as well as one other no critical sensor and to provide the program office and the processing centers an early opportunity to work with the sensors, ground control, and data processing systems.[4]

When the NPOESS development contract was awarded, the schedule for launching the satellites was driven by a requirement that the satellites be available to back up the final POES and DMSP satellites should anything go wrong during the planned launches of these satellites. Early program milestones included (1) launching NPP by May 2006, (2) having the first NPOESS satellite available to back up the final POES satellite launch in March 2008, and (3) having the second NPOESS satellite available to back up the final DMSP satellite launch in October 2009. If the NPOESS satellites were not needed to back up the final predecessor satellites, their

[4]The four sensors are the Visible/infrared imager radiometer suite, the Cross-track infrared sounder, the Advanced technology microwave sounder, and the Ozone mapper/profiler suite.

anticipated launch dates would have been April 2009 and June 2011, respectively.

Continuing Cost Increases, Schedule Delays, and Technical Problems Led to a Decision to Restructure the NPOESS Program

Over several years, we reported that NPOESS had experienced continued cost increases, schedule delays, and serious technical problems.[5] By November 2005, we estimated that the cost of the program had grown from $7 billion to over $10 billion. In addition, the program was experiencing major technical problems with the VIIRS sensor and expected to delay the launch date of the first satellite by almost 2 years. These issues ultimately required difficult decisions to be made about the program's direction and capabilities.

The Nunn-McCurdy law requires DOD to take specific actions when a major defense acquisition program growth exceeds certain cost thresholds.[6] Key provisions of the law require the Secretary of Defense to notify Congress when a major defense acquisition is expected to overrun its baseline by 15 percent or more and to certify the program to Congress when it is expected to overrun its baseline by 25 percent or more.[7] In November 2005, NPOESS exceeded the 25 percent threshold, and DOD was required to certify the program. Certifying a program entails providing a determination that (1) the program is essential to national security, (2) there are no alternatives to the program that will provide equal or greater military capability at less cost, (3) the new estimates of the program's cost are reasonable, and (4) the management structure for the program is adequate to manage and control costs. DOD established tri-agency teams—made up of DOD, NOAA, and NASA experts—to work on each of the four elements of the certification process.

In June 2006, DOD (with the agreement of both of its partner agencies) certified a restructured NPOESS program, estimated to cost $12.5 billion through 2026.[8] This decision approved a cost increase of $4 billion over the

[5]GAO-06-573T, GAO-06-249T, GAO-04-1054, GAO-03-987T, and GAO-02-684T.

[6]10 U.S.C. § 2433 is commonly referred to as Nunn-McCurdy.

[7]10 U.S.C. § 2433 has recently been amended by Pub. L. No. 109-163, § 802 (Jan. 6, 2006) and Pub. L. No. 109-364, § 213 (a) (Oct. 17, 2006). The law now also includes cost growth thresholds from the program's original baseline.

[8]DOD estimated that the acquisition portion of the certified program would cost $11.5 billion. The acquisition portion includes satellite development, production, and launch, but not operations and support costs after launch. When combined with an estimated $1 billion for operations and support after launch, this brings the program life cycle cost to $12.5 billion.

prior approved baseline cost and delayed the launch of NPP and the first 2 satellites by roughly 3 to 5 years. The new program also entailed reducing the number of satellites to be produced and launched from 6 to 4, and reducing the number of instruments on the satellites from 13 to 9—consisting of 7 environmental sensors and 2 subsystems. It also entailed using NPOESS satellites in the early morning and afternoon orbits and relying on European satellites for midmorning orbit data.[9] Table 2 summarizes the major program changes made under the Nunn-McCurdy certification decision.

Table 2: Summary of Changes to the NPOESS Program, as of June 2006

Key area	Program before the Nunn-McCurdy decision	Program after the Nunn-McCurdy decision
Life cycle range	1995-2020	1995-2026
Estimated life cycle cost	$8.4 billion	$12.5 billion
Launch schedule	NPP by October 2006	NPP by January 2010[a]
	First NPOESS by November 2009	First NPOESS by January 2013
	Second NPOESS by June 2011	Second NPOESS by January 2016
Management structure	System Program Director reports to a tri-agency steering committee and the tri-agency Executive Committee	System Program Director is responsible for day-to-day program management and reports to the Program Executive Officer
	Independent program reviews noted insufficient system engineering and cost analysis staff	Program Executive Officer oversees program and reports to the tri-agency Executive Committee
Number of satellites	6 (in addition to NPP)	4 (in addition to NPP)
Number of orbits	3 (early morning, midmorning, and afternoon)	2 (early morning and afternoon; will rely on European satellites for midmorning orbit data)
Number and complement of instruments	13 instruments (10 sensors and 3 subsystems)	9 instruments (7 sensors and 2 subsystems); 4 of the sensors are to provide fewer capabilities
Number of EDRs	55	39 (6 are to be degraded products)

Source: GAO analysis of NPOESS program office data.

[a]Although the Nunn-McCurdy certification decision specifies NPP is to launch by January 2010, NASA planned to launch it by September 2009 to reduce the possibility of a climate data continuity gap.

[9]The European Organization for the Exploitation of Meteorological Satellites' MetOp program is a series of three polar-orbiting satellites dedicated to operational meteorology. MetOp satellites are planned to be launched sequentially over 14 years. The first of these satellites was launched in 2006 and is currently operational.

The Nunn-McCurdy certification decision established new milestones for the delivery of key program elements, including launching NPP by January 2010,[10] launching the first NPOESS satellite (called C1) by January 2013, and launching the second NPOESS satellite (called C2) by January 2016. These revised milestones deviated from prior plans to have the first NPOESS satellite available to back up the final POES satellite should anything go wrong during that launch. Table 3 summarizes changes in key program milestones over time.

Table 3: Key Program Milestones

Milestones	As of the August 2002 contract award	As of the February 2004 rebaselined program	As of the June 2006 certification decision	Change from 2004 rebaselined program
Final POES launch[a]	March 2008	March 2008	February 2009	Not applicable
NPP launch	May 2006	October 2006	January 2010[b]	44-month delay
First NPOESS satellite planned for launch	April 2009	November 2009	January 2013	38-month delay
Final DMSP launch[a]	October 2009	May 2010	April 2012	Not applicable
Second NPOESS satellite planned for launch	June 2011	June 2011	January 2016	55-month delay

Source: GAO analysis of NPOESS program office data.

[a]POES and DMSP are not part of the NPOESS program. Their launch dates are provided to indicate the increased risk of satellite data gaps between when these systems launch and when the NPOESS satellites launch.

[b]Although the certification decision specified NPP is to launch by January 2010, NASA planned to launch it by September 2009 to reduce the possibility of a gap in climate data continuity.

Delaying the launch of the first NPOESS satellite meant that if the final POES satellite fails on launch, satellite data users would need to rely on the existing constellation of environmental satellites until NPP data becomes available—almost 2 years later. Although NPP was not intended to be an operational asset, NASA agreed to move NPP to a different orbit so that its data would be available in the event of a premature failure of the final POES satellite. If the health of the existing constellation of satellites diminishes—or if NPP data is not available, timely, and reliable—there could be a gap in environmental satellite data.

[10]According to program officials, although the Nunn-McCurdy certification decision specifies NPP is to launch by January 2010, NASA planned to launch it by September 2009 to reduce the possibility of a climate data continuity gap.

In order to reduce program complexity, the Nunn-McCurdy certification decision decreased the number of NPOESS sensors from 13 to 9 and reduced the functionality of 4 sensors. Specifically, of the 13 original sensors, 5 sensors remain unchanged (but 2 are on a reduced number of satellites), 3 were replaced with older or less capable sensors, 1 was modified to provide less functionality, and 4 were canceled. Table 4 delineates the changes made.

Table 4: Changes to NPOESS Instruments, as of June 2006 (critical sensors in bold)

Instrument	Status of instrument after Nunn-McCurdy Decision
Advanced technology microwave sounder	Sensor unchanged; to be included on NPP and on afternoon satellites
Aerosol polarimetry sensor	Sensor was canceled[a]
Conical-scanned microwave imager/sounder	Sensor was canceled; program office to procure a less complex microwave imager/sounder for inclusion beginning on the second NPOESS satellite
Cross-track infrared sounder	Sensor unchanged; to be included on NPP and on afternoon satellites
Data collection system	No change; subsystem is to be included on all four NPOESS satellites
Earth radiation budget sensor	Sensor was canceled; is to be replaced by a legacy sensor[a]
Ozone mapper/profiler suite	One part of the sensor (limb) was canceled; remaining part is to be included on NPP and on all four NPOESS satellites[a]
Radar altimeter	Sensor was canceled[a]
Search and rescue satellite aided tracking system	Sensor unchanged; subsystem is to be included on all four NPOESS satellites
Space environmental sensor suite	Sensor was canceled; is to be replaced by a less capable, less expensive legacy sensor[a]
Survivability sensor	Subsystem was canceled[a]
Total solar irradiance sensor	Sensor was canceled[a]
Visible/infrared imager radiometer suite	Sensor unchanged; sensor is to be included on NPP and on all four NPOESS satellites

Source: GAO analysis of NPOESS program office data.

[a]While direct program funding for these sensors was eliminated, these sensors could be reintegrated should other parties choose to fund them. The Nunn-McCurdy certification decision notes that the satellite bus is to include space for these sensors and funds to integrate them.

Table 5 shows the changes to NPOESS instruments, including the 4 critical sensors identified in bold, and the planned configuration for NPP and the four satellites of the NPOESS program, called C1, C2, C3, and C4. Program officials acknowledged that this configuration could change if other parties decided to develop the sensors that were canceled. However, they stated that the planned configuration of the first satellite (C1) cannot change without increasing the risk that the launch would be delayed.

Table 5: Planned Configuration of Instruments on NPP and NPOESS Satellites, as of January 2008 (critical sensors are in bold)

Instrument	NPP	NPOESS C1 (PM)	NPOESS C2 (AM)	NPOESS C3 (PM)	NPOESS C4 (AM)
Advanced technology microwave sounder	X	X	O	X	O
Aerosol polarimetry sensor	—	O	—	O	—
Microwave imager/sounder (replacing the Conical-scanned microwave imager/sounder)	—	—	X	X	X
Cross-track infrared sounder	X	X	O	X	O
Data collection system	—	X	X	X	X
Earth radiation budget sensor (replaced on NPP and C1 by the Clouds and the earth's radiant energy system sensor)	X[a]	X	—	O	—
Ozone mapper/profiler suite (nadir)	X	X	—	X	—
Ozone mapper/profiler suite (limb)	X[b]	O	—	O	—
Space environmental sensor suite	—	O	O	O	O
Space environment monitor[c] (replacing selected capabilities of the space environmental sensor suite)	—	X	—	X	—
Total solar irradiance sensor	—	—	O	—	O
Radar altimeter	—	—	O	—	O
Survivability sensor	—	O	O	O	O
Search and rescue satellite aided tracking system	—	X	X	X	X
Visible/infrared imager radiometer suite	X	X	X	X	X

Key:

X = Sensor is currently planned for this satellite

O = Sensor was canceled but could be restored to this satellite

— = Not applicable—sensor was never planned for this satellite

Source: GAO analysis of program office data.

[a]The NPOESS Executive Committee recently decided to add the Clouds and the earth's radiant energy system to the NPP satellite to reduce the risk of a data gap of earth radiation budget data.

[b]The limb component of the Ozone mapper/profiler suite was added back to NPP using NASA/NOAA funds from outside the NPOESS baseline program.

[c]The space environment monitor is a limited version of the full space environmental sensor suite.

The changes in NPOESS sensors affected the number and quality of the resulting weather and environmental products, called EDRs. In selecting sensors for the restructured program during the Nunn-McCurdy process, decision makers placed the highest priority on continuing current operational weather capabilities and a lower priority on obtaining selected environmental and climate measuring capabilities. As a result, the revised

NPOESS system has significantly less capability for providing global climate measures than was originally planned. Specifically, the number of EDRs was decreased from 55 to 39, of which 6 are of a reduced quality. The 39 EDRs that remain include cloud base height, land surface temperature, precipitation type and rate, and sea surface winds. The 16 EDRs that were removed include cloud particle size and distribution, sea surface height, net solar radiation at the top of the atmosphere, and products to depict the electric fields in the space environment. The 6 EDRs that are of a reduced quality include ozone profile, soil moisture, and multiple products depicting energy in the space environment.

Prior Report Recommended Steps to Mitigate Program Risks

In April 2007, we reported that while the program office had made progress in restructuring NPOESS since the June 2006 Nunn-McCurdy certification decision, important tasks leading up to finalizing contract changes remained to be completed.[11] Specifically, the program had established and implemented interim program plans guiding the contractor's work activities in 2006 and 2007 and had made progress on drafting key acquisition documents, including the system engineering plan, the test and evaluation master plan, and the memorandum of agreement between the agencies. However, executive approval of those documents was about 6 months late at that time—due in part to the complexity of navigating three agencies' approval processes.

We also reported that the program office had made progress in establishing an effective management structure, but that plans to reassign the Program Executive Officer would unnecessarily increase risks to an already risky program. Additionally, we found that the program lacked a process and plan for identifying and filling staffing shortages, which led to delays in key activities such as cost estimating and contract revisions. We reported that until this process is in place, the NPOESS program faced increased risk of further delays.

To address these issues, we recommended that the appropriate agency executives finalize key acquisition documents by the end of April 2007 in order to allow the restructuring of the program to proceed. We also recommended that NPOESS program officials develop and implement a written process for identifying and addressing human capital needs and that they establish a plan to immediately fill needed positions. In addition, to

[11] GAO-07-498.

reduce program risks, we recommended that DOD delay the reassignment of the Program Executive Officer until all sensors were delivered to NPP.

The agencies' response to these recommendations has been mixed. While the program office is still working to complete selected acquisition documents, program officials documented the program's staffing process and have made progress in filling selected budgeting and system engineering vacancies. DOD, however, reassigned the Program Executive Officer in July 2007. A new Program Executive Officer is now in place.

Earned Value Management Techniques Provide Insight on Program Cost and Schedule

To effectively oversee an acquisition, project managers need current information on a contractor's progress in meeting contract deliverables. One method that can help project managers track this progress is earned value management. This method, used by DOD for several decades, compares the value of work accomplished during a given period with that of the work expected in that period.

Differences from expectations are measured in both cost and schedule variances. Cost variances compare the earned value of the completed work with the actual cost of the work performed. For example, if a contractor completed $5 million worth of work and the work actually cost $6.7 million, there would be a -$1.7 million cost variance. Schedule variances are also measured in dollars, but they compare the earned value of the work completed with the value of work that was expected to be completed. For example, if a contractor completed $5 million worth of work at the end of the month but was budgeted to complete $10 million worth of work, there would be a -$5 million schedule variance. Positive variances indicate that activities are costing less or are completed ahead of schedule. Negative variances indicate activities are costing more or are falling behind schedule. These cost and schedule variances can then be used in estimating the cost and time needed to complete the program.

Major Restructuring Activities Have Been Completed, but Key Activities Remain

The program office has completed major activities associated with restructuring NPOESS, but key supporting activities remain—including obtaining approval of key acquisition documents. Restructuring a major acquisition program like NPOESS is a process that involves reassessing and redefining the program's deliverables, costs, and schedules, and renegotiating the contract. The restructuring process also involves revising important acquisition documents such as the tri-agency memorandum of agreement, the acquisition strategy, the system engineering plan, the

integrated master schedule defining what needs to happen by when, and the acquisition program baseline.

During the past year, the program redefined the program's deliverables, costs, and schedules, and renegotiated the NPOESS contract. To do so, the program developed a new program plan and conducted an integrated baseline review of the entire program, which validated that the new deliverables, costs, and schedules were feasible. It also completed key acquisition documents including the system engineering plan and the integrated master schedule. The program and the prime contractor renegotiated their agreement and signed a modified contract in July 2007.

However, key activities remain to be completed, including obtaining executive approval of key acquisition documents. Specifically, even though agency officials were expected to approve key acquisition documents by September 2007, the appropriate executives have not yet signed off on documents including the tri-agency memorandum of agreement or the acquisition strategy report. They have also not signed off on the acquisition program baseline, the fee management plan, the test and evaluation master plan, and the two-orbit program plan (a plan for how to use European satellite data with NPOESS). Appendix II provides more information on the status of these documents.

Program officials stated that the program has been able to renegotiate the contract and to proceed in developing sensors and systems without these documents being signed because the documents have widespread acceptance within the three agencies. They reported that the delays are largely due to the complexity of obtaining approval from three agencies. For example, program officials reported that an organization within DOD suggested minor changes to the tri-agency memorandum of agreement after months of coordination and after it had already been signed by both the Secretary of Commerce and the Administrator of NASA. The program office has now made the recommended changes and is re-initiating the coordination process. In addition, NASA disagreed with the fee management plan because it wanted to have an incentive associated with the on-orbit performance of the NPP satellite. The program office is currently trying to address NASA's concerns, but stated that the current plan is in effect for this fiscal year and any changes would have to wait until fiscal year 2009. These disagreements further delay an already delayed restructuring process. Without executive approval of key acquisition documents, the program lacks the underlying commitment necessary to effectively manage a tri-agency program. In our prior report,

we recommended that the appropriate executives immediately finalize key acquisition documents. This recommendation remains open.

NPOESS Program Has Made Progress, but Key Milestones Have Been Delayed and Risks Remain

Over the last year, the NPOESS program has made progress by completing planned development and testing activities on its ground and space segments, but key milestones for delivering the VIIRS sensor and launching NPP have been delayed by about 8 months. Moving forward, risks remain in completing the testing of key sensors and integrating them on the NPP spacecraft, in resolving interagency disagreements on the appropriate level of system security, and in revising estimated costs for satellite operations and support. The program office is aware of these risks and is working to mitigate them, but continued problems could affect the program's overall schedule and cost. Given the tight time frames for completing key sensors, integrating them on the NPP spacecraft, and getting the ground-based data processing system developed, tested, and deployed, it is important for the NPOESS Integrated Program Office, the Program Executive Office, and the Executive Committee to continue to provide close oversight of milestones and risks.

Ground Segment—Progress Has Been Made, but Important Work Remains to Be Done

Development of the ground segment—which includes the interface data processing system, the ground stations that are to receive satellite data, and the ground-based command, control, and communications system—is under way and on track. For example, the Interface Data Processing System has been installed at one of the two locations that are to receive NPP data, and the command, control, and communications system passed acceptance testing for use with NPP. However, important work in developing the algorithms that translate satellite data into weather products within the integrated data processing segment remains to be completed. Table 6 describes each of the components of the ground segment and identifies the program-provided risk level and status of each.

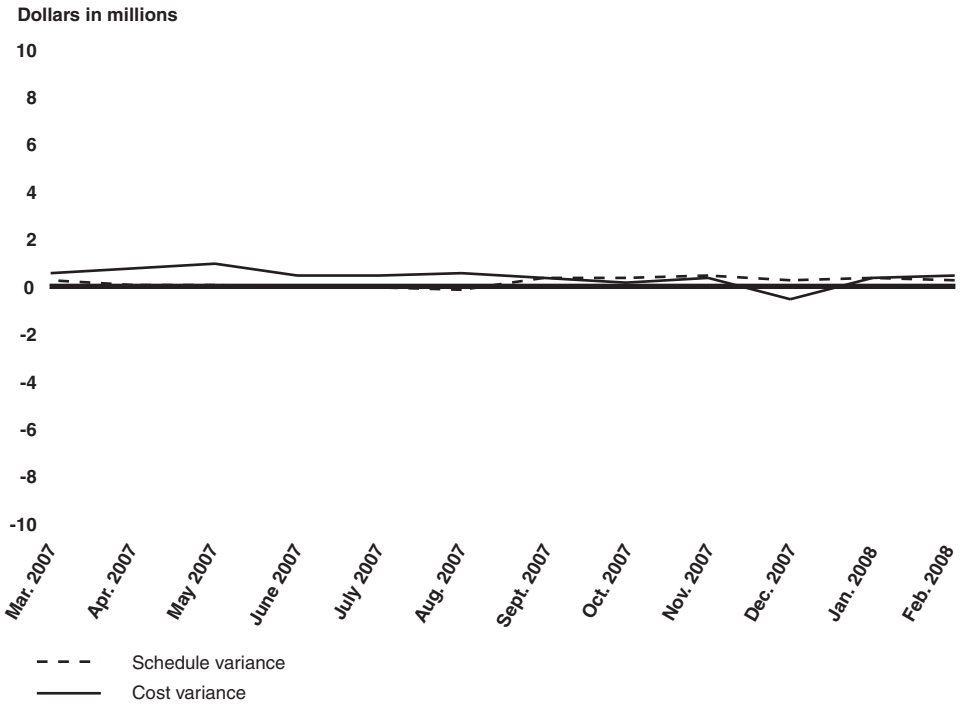
Table 6: Status of Ground Segment Components

Ground segment component/ description	Program-identified risk level	Status
Interface Data Processing System (IDPS) A ground-based system that is to process the sensors' data so that they are usable by the data processing centers and the broader community of environmental data users. IDPS will be deployed at the four weather data processing centers.	Low	IDPS software is being developed in a series of builds. In 2007, software developers required additional resources and fell behind schedule on build 1.5 activities due to unanticipated complexities in developing algorithms that will make use of data collected by the Ozone mapper/profiler suite in orbit—as well as late delivery of key information on this instrument. As of January 2008, IDPS build 1.5 had been developed and was undergoing testing to check the quality of its performance; additional builds are planned to be developed prior to launch and will be used with NPP. In January 2008, IDPS hardware was installed at one of the data processing centers (NOAA's National Satellite Operations Facility in Suitland, Maryland) and is expected to be installed at the Air Force Weather Agency in the spring. In addition, the Air Force Weather Agency has begun early testing of NPOESS data. Site acceptance testing for NPP is scheduled to be completed in December 2008.
Ground stations for receiving satellite data 15 unmanned ground stations around the world (called SafetyNet™) are to receive satellite data and send it to the four data processing centers.	Low	NOAA is working with domestic and foreign authorities to obtain approval to operate ground stations to receive satellite data. According to agency officials, the full complement of ground stations will not be in place in time for the first NPOESS satellite launch. The ground stations will be phased in by the launch of the second satellite. To date, the program office has reached agreement with 4 of 15 ground station sites.
Command, control, and communications segment Performs the day-to-day monitoring and command of the spacecraft and sensors	Low	The command, control, and communications segment is being developed in a series of builds. In August 2007, build 1.4 transitioned from development to operations and support. In addition, the command, control, and communications acceptance testing for NPP has been completed.

Source: GAO summary of NPOESS program office data.

Using contractor-provided data, our analysis of the earned value data for the ground segment indicates that cost and schedule performance were generally on track between March 2007 and February 2008 (see fig. 7). Between these dates, the contractor completed slightly more work than planned on both the IDPS and command, control, and communications components. In addition, the contractor finished slightly over budget for the IDPS component and slightly under budget for the command, control, and communications component. This caused cost and schedule variances that were less than 1 percent off of expectations.

Figure 7: Cumulative Cost and Schedule Variances for the NPOESS Ground Segment over a 12-month Period



Source: GAO analysis based on contractor data.

Space Segment—Progress Made, but One Sensor Has Been Delayed and Sensors Continue to Face Risks

Over the past year, the program made progress on the development of the space segment, which includes the sensors and the spacecraft. Five sensors are of critical importance because they are to be launched on the NPP satellite.[12] Initiating work on another sensor, the Microwave Imager Sounder, is also important because this new sensor—which is to replace the canceled Conical-scanned microwave imager/sounder sensor—will need to be developed in time for the second NPOESS satellite launch. Among other activities, the program has successfully completed ambient testing of the VIIRS flight unit, structural vibration testing of the flight unit of the Cross-track infrared sounder, risk reduction testing of the flight unit of the Ozone mapper/profiler suite, and thermal testing of the NPP

[12]NPP is to include the Visible/infrared imager radiometer suite, Cross-track infrared sounder, Advanced technology microwave sounder, Ozone mapper/profiler suite (nadir and limb), and the Clouds and the earth's radiant energy system.

spacecraft with three sensors on board.[13] In addition, the program made decisions on how to proceed with the Microwave imager sounder and plans to contract with a government laboratory by the end of April 2008.

However, the program experienced problems on VIIRS, including poor workmanship on selected subcomponents and delays in completing key tests. These issues delayed VIIRS delivery to the NPP contractor by 8 months. This late delivery will in turn delay the NPP launch from late September 2009 to early June 2010. This delay in NPP shortens the time available for incorporating lessons learned from NPP while it is in orbit into future NPOESS missions and could lead to gaps in the continuity of climate and weather data if predecessor satellites fail prematurely. Also, the Cross-track infrared sounder sensor experienced a cost overrun and schedule delays as the contractor worked to recover from a structural failure. The status and risk level of each of the components of the space segment is described in table 7.

Table 7: Status of Selected Components of the Space Segment, as of January 2008

Space segment component	Program-identified risk level	Status
Visible/infrared imager radiometer suite	High	In April 2007, we reported that the contractor had identified a problem with the VIIRS baseline filter during environmental testing that caused degraded performance in the filter's image quality. Specifically, this problem involves light leaking across the seams of the filter, resulting in inaccurate measurements of ocean color. In October 2007, the NPOESS Executive Committee decided to continue sensor development with the baseline filter because changing it would increase risks to sensor development, delay the delivery of the sensor, and risk delays to the launch of NPP. An improved VIIRS filter is planned to be included on the flight units on future NPOESS missions. More recently, the VIIRS contractor experienced problems with workmanship on electrical and cryoradiator components and delays in executing tests.[a] These factors slowed the sensor's development. The VIIRS flight unit was originally scheduled to be delivered to NPP by July 2008, but due to technical issues and testing schedule delays, VIIRS' delivery to NPP is now planned for April 2009.

[13] The three sensors included the flight unit for the Advanced technology microwave sounder and engineering design units for the Visible/infrared imager radiometer suite and the Cross-track infrared sounder.

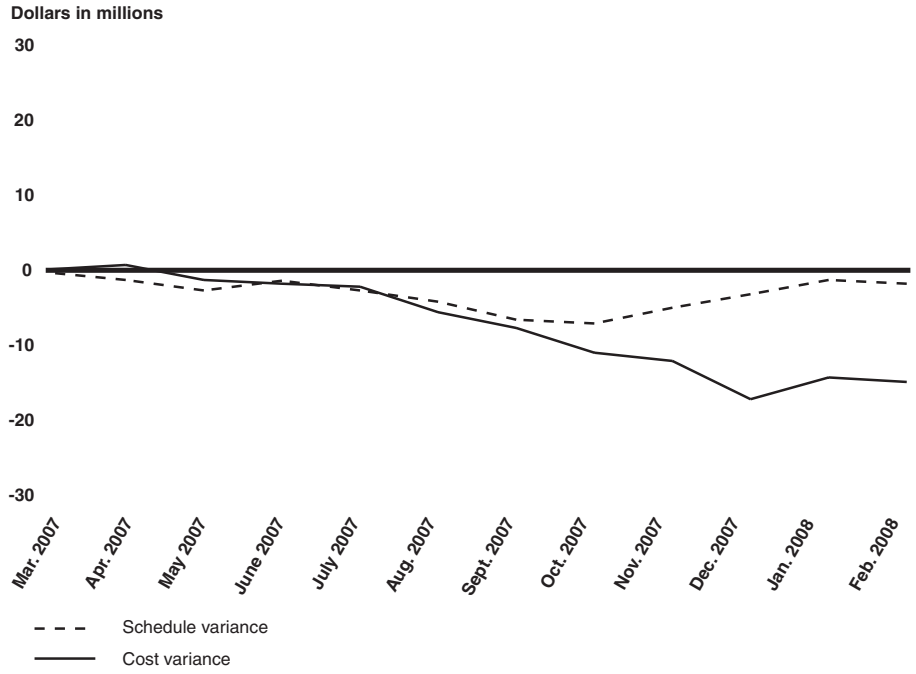
Space segment component	Program-identified risk level	Status
Cross-track infrared sounder (CrIS)	Moderate	In April 2007, we reported that development of CrIS was put on hold in October 2006 when the flight unit designated to go on NPP experienced a major structural failure during its vibration testing. Acceptance testing began again in mid-2007, and the structural stability of the frame was approved in August 2007. The flight unit is currently undergoing thermal vacuum testing. The flight unit was expected to be delivered to NPP by February 2008, but it is now expected to be delivered in May 2008.
Ozone mapper/profiler suite (nadir and limb)	Low	In April 2007, program officials had agreed to fund the reintegration of the limb component on NPP. By December 2007, the first flight unit completed key integration risk reduction testing. It is expected to be delivered to the NPP contractor for integration in August 2008.
Advanced technology microwave sounder	Low	The flight unit for NPP was developed by a NASA contractor and delivered to the program in October 2005. The NPP contractor integrated the flight unit on the spacecraft in December 2006 and is awaiting delivery of the other sensors in order to complete integration testing.
Clouds and the earth's radiant energy system	Not yet rated	In January 2008, the NPOESS Executive Committee approved including this instrument on NPP. The sensor has already been built but requires some refurbishment. It is expected to be delivered to the NPP spacecraft for integration in October 2008. In January 2008, the program office was directed to develop an additional sensor for the C1 satellite.
Microwave imager/ sounder	Not yet rated	A new microwave imager/sounder sensor is being planned to replace the canceled Conical-scanned microwave imager/sounder. The program office anticipates awarding a contract to develop the sensor by the end of April 2008.
Spacecraft	Low	Both the development of the spacecraft for NPP and the spacecraft for NPOESS are on track. The NPP spacecraft was completed in June 2005. The NPP contractor has completed over a year's worth of risk reduction activities, which included thermal testing of the spacecraft with three of the sensors on board. A preliminary audit of the spacecraft design for NPOESS was completed on schedule in November 2007. However, a remaining risk involves a key control system, which has caused a labor increase and is taking longer than anticipated to resolve. The critical design review of the first NPOESS spacecraft is scheduled to be completed in April 2009, with the launch date scheduled for January 2013.

Source: GAO analysis of NPOESS Integrated Program Office data.

[a]The cryoradiator is a key component of the VIIRS sensor. It is intended to cool down components of the sensor.

Our analysis of contractor-provided earned value data showed that the NPOESS space segment has experienced negative cost and schedule variances between March 2007 and February 2008 (see fig. 8). Specifically, the contractor exceeded cost targets for the space segment by $15.1 million —which is 5.1 percent of the $298.2 million space segment budget for that time period. Similarly, the contractor was unable to complete $2 million worth of work in the space segment—which is less than 1 percent of the space segment budget for that time period.

Figure 8: Cumulative Cost and Schedule Variance for the NPOESS Space Segment over a 12-Month Period



Source: GAO analysis based on contractor data.

Program Risks Remain; Continued Oversight Is Needed to Prevent Further Cost Increases and Schedule Delays

Moving forward, the program continues to face risks. Over the next 2 years, it will need to complete the development of the key sensors, test them, integrate and test them on the NPP spacecraft, and test these systems with the ground-based data processing systems. In addition, the program faces two other issues that could affect its overall schedule and cost. One is that there continues to be disagreement between NOAA and DOD on the appropriate level of system security. To date, NPOESS has been designed and developed to meet DOD's standards for a mission essential system, but NOAA officials believe that the system should be built to meet more stringent standards. Implementing more stringent standards could cause rework and retesting, and potentially affect the cost and schedule of the system. Another issue is that program life cycle costs could increase once a better estimate of the cost of operations and support is known. The $12.5 billion estimated life cycle cost for NPOESS includes a rough estimate of $1 billion for operations and support. Program officials have identified the potential for this cost to grow as a moderate risk.

The NPOESS program office is working closely with the contractor and subcontractors to resolve these program risks. To address sensor risks, the program office and officials from NASA's Goddard Space Flight Center commissioned an independent review team to assess the thoroughness and adequacy of practices being used in the assembly, integration, and testing of the VIIRS and CrIS instruments in preparation for the NPP spacecraft. The team found that the contractors for both sensors had sound test programs in place, but noted risks with VIIRS's schedule and with CrIS's reliability and performance. The program office adjusted the VIIRS testing schedule and is monitoring the CrIS testing results. In addition, the program office recently instituted biweekly senior-level management meetings to review progress on VIIRS's development, and program officials noted that both the prime contractor and the program executive office will have senior officials onsite at the contractor's facility to provide extensive, day-to-day oversight of management activities to assist in resolving issues.

To address the risk posed by changing security requirements late in the system's development, program officials commissioned a study to determine the effect of more stringent standards on the system. This study was completed by the end of March 2008, but has not yet been released. To address the risk of cost growth due to poor estimates of operations and support costs, DOD's cost analysis group is currently refining this estimate. A revised estimate is expected by June 2008.

The program office is aware of program risks and is working to mitigate them, but continued problems could affect the program's overall schedule and cost. Given the tight time frames for completing key sensors, integrating them on the NPP spacecraft, and getting the ground-based data processing system developed, tested, and deployed, it is important for the NPOESS program office, the Program Executive Office, and the Executive Committee to continue to provide close oversight of milestones and risks.

Program Office Identified Preferred Timelines for Decisions on Restoring Sensors to NPOESS

When the Nunn-McCurdy restructuring agreement removed certain sensors from NPOESS, the program was instructed to plan for the reintegration of those sensors. Specifically, the certification decision directed the program to build each NPOESS spacecraft with enough room and power to accommodate the sensors that were removed from the program and to fund the integration and testing of any sensors that are later restored. Agency sponsors external to the program are responsible for justifying and funding the sensor's development, while the NPOESS Executive Committee has the final decision on whether to include the sensor on a specific satellite. Table 8 denotes sensors that were canceled under the Nunn-McCurdy agreement, but could be restored to the different satellites.

Table 8: Sensors That Could be Restored to NPOESS Satellites

Sensor	NPOESS C2 (AM orbit)	NPOESS C3 (PM orbit)	NPOESS C4 (AM orbit)
Aerosol polarimetry sensor	—	O	—
Advanced technology microwave sounder	O	X	O
Cross-track infrared sounder	O	X	O
Earth radiation budget sensor	—	O	—
OMPS (limb)	—	O	—
Radar altimeter	O	—	O
Space environmental sensor suite	O	O	O
Survivability sensor	O	O	O
Total solar irradiance sensor	O	—	O

Key:

O = Canceled but could be restored to this satellite

— = Not applicable—sensor was never planned for this satellite

X = Currently planned for this satellite

Source: GAO analysis of agency data.

Note: In order to mitigate risks, program officials do not plan to consider any changes to the first NPOESS satellite (C1).

The NPOESS program office has requested that any entities that plan to restore a sensor to an NPOESS satellite provide them 6 years' notice. This includes 4 years for the sensor to be developed and tested, and 2 years for integration and testing on the spacecraft. Table 9 provides a listing of dates based on current launch dates for each NPOESS satellite.

Table 9: Program's Timelines for Restoring Canceled Sensors

Satellite	Sensor notice preferred by (date)	Sensor needed for integration and testing	Planned satellite launch
C1[a]	n/a	n/a	January 2013
C2	January 2010	January 2014	January 2016
C3	January 2012	January 2016	January 2018
C4	January 2014	January 2018	January 2020

Source: NPOESS Integrated Program Office.

[a]In order to mitigate risks, program officials do not plan to consider changes to the first NPOESS satellite (C1).

The program office developed its tentative timelines using historical data for similar programs, but program officials reported that more or less time might be required depending on the status of the sensor to be added. For example, a sensor based on existing sensors may require less time, while a more advanced sensor could require more time.

Agencies Have Undertaken Preliminary Steps to Restore Key Sensors, but Lack Timely Plans to Ensure Long-Term Data Continuity

NASA, NOAA, and DOD have taken preliminary steps to restore the capabilities of selected climate and space weather sensors that were degraded or removed from the NPOESS program by prioritizing the sensors, assessing options for restoring them, and making decisions to restore two sensors in order to mitigate near-term data gaps. However, the agencies have not yet developed plans to mitigate the loss of these sensors on a long-term basis. Best practices in strategic planning suggest that agencies develop and implement long-term plans to guide their short-term activities. Until such plans are developed, the agencies may lose their windows of opportunity for selecting cost-effective options or they may resort to an ad hoc approach to restoring these sensors. Lacking plans almost 2 years after key sensors were removed from the NPOESS program, the agencies face increased risk of gaps in the continuity of climate and space environment data.

While NPOESS was originally envisioned to provide only weather observations, this mission was later expanded to include long-term continuity for key climate data. Maintaining the continuity of climate and space data over decades is important to identify long-term environmental cycles (such as the 11-year solar cycle and multiyear ocean cycles including the El Niño effect) and their impacts, and to detect trends in

climate change and global warming. The Nunn-McCurdy restructuring decision removed four sensors[14] and degraded the functionality of four other sensors that were to provide these data. DOD, NASA, and NOAA are now responsible for determining what to restore, how to restore it, and the means for doing so. This responsibility includes justifying the additional funding needed to develop these sensors within their respective agencies' investment decision processes. Best practices of leading organizations call for defining a strategic plan to formalize priorities and plans for meeting mission goals. Such a plan would include the agency's long-term goals for climate and space weather measurements, the short-term activities needed to attain these goals, and the milestones and resources needed to support the planned activities.

NASA, NOAA, and DOD Have Identified Priorities, Assessed Options, and Made Decisions to Restore Two Sensors

Since the June 2006 restructuring, NASA, NOAA, and DOD have taken preliminary steps to restore sensor capabilities by determining priorities for restoring sensor capabilities, assessing options for obtaining sensor data over time, and making decisions to restore selected sensors. Specifically, in August 2006, the NPOESS Senior User Advisory Group—a group representing NASA, NOAA, and DOD system users—assessed the impact of the canceled or degraded sensors and identified priorities for restoring them. In January 2007, a NOAA and NASA working group on climate sensors prioritized which of the sensors were most important to restore for climate purposes and proposed possible solutions and mitigation efforts. In addition, the National Research Council (NRC) reported on the impact of the canceled sensors.[15] Table 10 summarizes the results of these studies.

[14]The restructuring decision provided for replacing one of the removed sensors (the Conical microwave imager/sounder) with a sensor with reduced functionality (the Microwave imager/sounder).

[15] National Research Council, *Options to Ensure the Climate Record from the NPOESS and GOES-R Spacecraft: A Workshop Report* (Washington, D.C.: 2007. Prepublication)

Table 10: Summary of Studies on Impacts of the Loss of Sensors and Priorities for Restoring Them

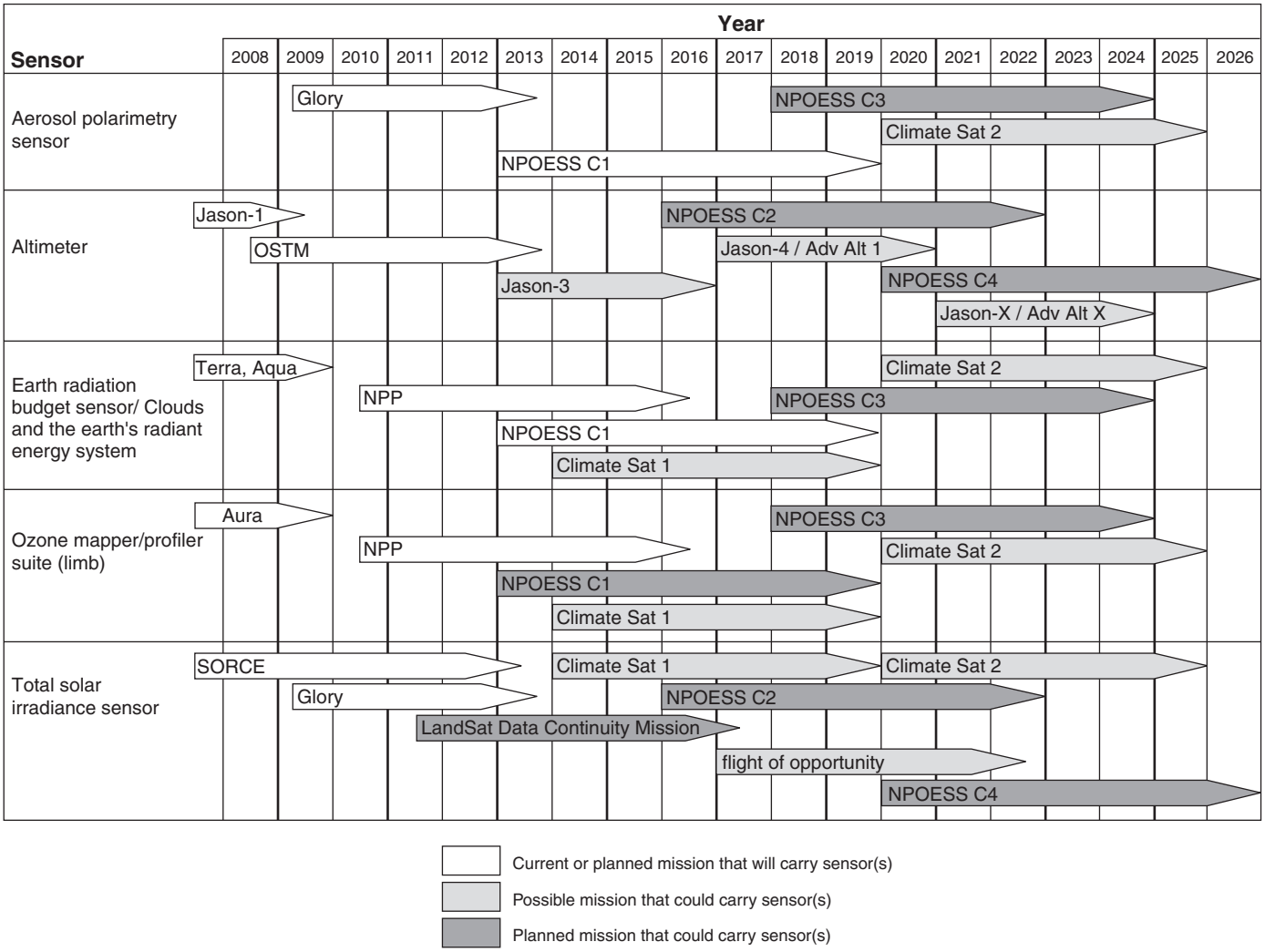
Sensor/ Description	Likely impact of sensor loss	Climate Working Group's priority for restoration	NPOESS Advisory Group's priority for restoration
Aerosol polarimetry sensor	• Decreased ability to improve air quality monitoring over time • Decreased ability to improve understanding of aerosol's impact on the earth's radiation budget; that is, whether aerosols play a role in global warming • Decreased ability to study the global distribution of aerosols and the impact of aerosols on climate • Decreased ability to improve military munitions targeting and intelligence collection	6	7
Conical-scanned microwave imager/sounder, to be replaced by the Microwave imager/sounder	• Cancellation of the Conical-scanned microwave imager/sounder raised concerns about the loss of critical environmental data including sea surface temperatures, ice and snow cover, and ocean surface wind speed. • The Microwave imager/sounder is intended to replace the Conical-scanned microwave imager/sounder. However, because the new sensor's capabilities have not yet been fully defined, the impact of the cancellation of the Conical-scanned microwave imager/sounder is not clear.	5	2
Earth radiation budget sensor (being replaced on selected satellites by an existing sensor, the Clouds and the earth's radiant energy system)	• Decreased ability to measure the amount of energy entering and leaving the earth • Reduced ability to determine the causes of climate variability and change • Disruption of an over 28-year measurement heritage of earth radiation budget data, which is needed to assess long-term trends.	2	6
Ozone mapper/profiler suite (limb)	• Decreased ability to understand the health of the ozone layer which absorbs solar ultraviolet radiation that is potentially harmful to humans. • Decreased ability to improve global warming and air quality models to differentiate the impact of changing ozone levels within the atmosphere.	4	4
Space environmental sensor suite (to be replaced on selected satellites by an existing technology sensor, the Space environment monitor)	• Decreased understanding of the effect of space weather on military and civilian communications and electrical systems • Decreased situational awareness for missile intercept capabilities	unranked	1
Total solar irradiance sensor	• Decreased ability to understand the influence of natural causes of climate change • Disruption of an over 28-year measurement heritage of solar irradiance data, which is needed to assess long-term trends.	1	5

Sensor/ Description	Likely impact of sensor loss	Climate Working Group's priority for restoration	NPOESS Advisory Group's priority for restoration
Radar altimeter	• Reduced number of sea surface height and other ocean measurements used in climate monitoring • Decreased ability to measure sea-air interactions that affect regional weather patterns, such as El Niño. • Decreased understanding of storm intensification (e.g., hurricanes), coastal turbulence, and underwater features important to sailors.	3	3
Survivability sensor	• Sensor was to identify possible threats to the NPOESS spacecraft and has no impact on climate observations.	unranked	8

Source: GAO analysis of NASA, NOAA, DOD, and NRC data.

In addition to prioritizing the sensors, NASA, NOAA, and DOD identified a variety of options for obtaining key sensor data over the next two decades and continue to seek other options. The agencies identified options including adding sensors back to a later NPOESS satellite, adding sensors to another planned satellite, and developing a new satellite to include several of the sensors. Examples of options for several sensors are provided in figure 9. In addition, in December 2007, NOAA released a request for information to determine whether commercial providers could include selected environmental sensors on their satellites.

Figure 9: Selected Options for Restoring Selected Climate Sensors, as of January 2008



Sources: DOD, NASA, and NOAA data.

Notes: The satellites Terra, Aqua, Aura, Glory, and the Solar radiation and climate experiment (SORCE) are all NASA missions. The Landsat data continuity mission is a joint mission between NASA and the U.S. Geological Survey, Jason-1 is a joint mission between NASA and France, and the Ocean surface topography mission (OSTM) is a joint mission between NASA, NOAA, France, and the European Organization for the Exploitation of Meteorological Satellites.

The MIS sensor is not included in this chart because NOAA, NASA, and DOD have already agreed to include it on the second, third, and fourth NPOESS satellites. Options for the Space environment sensor suite/Space environment monitor and the Survivability sensor are not included because DOD has not yet released them.

In addition to prioritizing sensors and identifying options, over the last year, NASA, NOAA, and DOD have taken steps to restore two sensors on a near-term basis. Specifically, in April 2007, the NPOESS Executive Committee decided to restore the limb component of the Ozone mapper/profiler suite to the NPP satellite and, in January 2008, to add the Clouds and the earth's radiant energy system to NPP. These decisions are expected to provide continuity for these sensors through approximately 2015. NASA officials noted that they also took steps to mitigate a potential gap in total solar irradiance data by proposing to fund an additional 4 years of the SORCE mission (from 2008 to 2012).

Agencies Lack Plans to Ensure Long-Term Data Continuity

While NASA, NOAA, and DOD have taken preliminary steps to address the climate and space sensors that were removed from the NPOESS program almost 2 years ago, they do not yet have plans for restoring climate and space environment data on a long-term basis. The Office of Science and Technology Policy, an organization within the Executive Office of the President, is currently working with NASA, NOAA, and DOD to sort through the costs and benefits of the various options and to develop plans. However, this effort has been under way for almost 2 years and officials could not estimate when such plans would be completed.

Delays in developing a comprehensive strategy for ensuring climate and space data continuity may result in the loss of selected options. For example, NASA and NOAA estimated that they would need to make a decision on whether to include a Total solar irradiance sensor on its planned Landsat Data Continuity Mission by March 2008, and on whether to build another satellite to obtain ocean altimeter data in 2008. Also, the NPOESS program office estimated that if any sensors are to be restored to an NPOESS satellite, it would need a decision about 6 years in advance of the planned satellite launch. Specifically, for a sensor to be included on the second NPOESS satellite, the sponsoring agency would need to commit to do so by January 2010.

Without a timely decision on a plan for restoring satellite data on a long-term basis, NASA, NOAA, and DOD risk losing their windows of opportunity on selected options and restoring sensors in an ad hoc manner. Ultimately, the agencies risk a break in the continuity of climate and space environment data. As national and international concerns about climate change and global warming grow, these data are more important than ever to try to understand long-term climate trends and impacts.

Conclusions

Over the past year, program officials have completed major activities associated with restructuring the NPOESS program and have made progress in developing and testing sensors, ground systems, and the NPP spacecraft. However, agency executives have still not signed off on key acquisition documents that were to be completed in September 2007, and one critical sensor has experienced technical problems and schedule delays that have led program officials to delay the NPP launch date by about 8 months. Any delay in the NPP launch date shortens the time available for incorporating lessons learned from NPP onto future NPOESS missions and could also lead to gaps in critical climate and weather data.

When selected climate and space weather sensors were removed from the NPOESS program during its restructuring, NASA, NOAA, and DOD became responsible for determining what sensors to restore and how to restore them. This responsibility includes justifying the additional funding needed to develop these sensors within their respective agency's investment decision processes. In the 2 years since the restructuring, the agencies have identified their priorities and assessed their options for restoring sensor capabilities. In addition, the agencies made decisions to restore two sensors to the NPP satellite in order to mitigate near-term data gaps. However, the agencies lack plans for restoring sensor capabilities on a long-term basis. Without a timely decision on a long-term plan for restoring satellite data, the agencies risk a break in the continuity of climate and space environment data. With the increased concern about climate change and global warming, these data are more important than ever to try to understand long-term climate trends and impacts.

Recommendations for Executive Action

In order to bring closure to efforts that have been under way for years, we are making recommendations to the Secretaries of Commerce and Defense and to the Administrator of NASA to establish plans on whether and how to restore the climate and space sensors removed from the NPOESS program by June 2009, in cases where the sensors are warranted and justified.

In addition, we are reemphasizing our prior recommendation that the appropriate NASA, NOAA, and DOD executives immediately finalize key acquisition documents.

Agency Comments

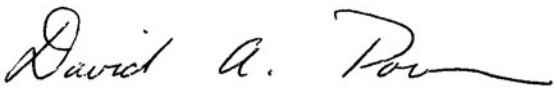
We received written comments on a draft of this report from the Secretary of the Department of Commerce (see app. III), the Deputy Assistant Secretary for Networks and Information Integration of the Department of

Defense (see app. IV), and the Associate Administrator for the Science Mission Directorate of the National Aeronautics and Space Administration (see app. V). In their comments, all three agencies concurred with our recommendations. In addition, both the Department of Commerce and NASA reiterated that they are working with their partner agencies to finalize plans for restoring sensors to address the nation's long-term needs for continuity of climate measurements. Further, Commerce noted that DOD and NASA executives need to weigh in to resolve issues at, or immediately below, their levels in order to ensure prompt completion of the key acquisition documents. NASA noted that difficulties in gaining consensus across all three NPOESS agencies have delayed the signature of key acquisition documents, and reported that they are committed to moving these documents through the signature cycle once all of the issues and concerns are resolved.

All three agencies also provided technical comments, which we have incorporated in this report as appropriate.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of this report to interested congressional committees, the Secretary of Commerce, the Secretary of Defense, the Administrator of NASA, the Director of the Office of Management and Budget, and other interested parties. In addition, this report will be available at no charge on our Web site at http://www.gao.gov.

If you have any questions on matters discussed in this report, please contact me at (202) 512-9286 or by e-mail at pownerd@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix VI.



David A. Powner
Director, Information Technology
Management Issues

Appendix I: Objectives, Scope, and Methodology

Our objectives were to (1) evaluate the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program office's progress in restructuring the acquisition, (2) assess the status of key program components and risks, (3) identify how much notice the program office would need if agency sponsors outside the program choose to restore the eliminated or degraded sensors to the NPOESS program, and (4) assess plans of the National Oceanic and Atmospheric Administration (NOAA), the Department of Defense (DOD), and the National Aeronautics and Space Administration (NASA) for obtaining the environmental data originally planned to be collected by NPOESS sensors, but then eliminated under the restructuring.

To evaluate the NPOESS program office's progress in restructuring the acquisition program, we reviewed the program's Nunn-McCurdy certification decision memo, a later addendum to this decision, and program documentation including copies of required documentation, status briefings, and milestone progress reports. We also interviewed program office officials and attended senior-level management program review meetings to obtain information on the program's acquisition restructuring.

To evaluate the status of key program components and risks, we reviewed program documentation associated with the program and its key components. We analyzed briefings and monthly program management documents to determine the status and risks of the program and key program segments. We also analyzed earned value management data obtained from the contractor to assess the contractor's performance against cost and schedule estimates. We obtained adequate assurance that these agency-provided data had been tested and were sufficient for our assessment purposes. We reviewed cost reports and program risk management documents and interviewed program officials to determine program and program segment risks that could negatively affect the program's ability to maintain the current schedule and cost estimates. We also interviewed agency officials from NASA, NOAA, DOD, and the NPOESS program office to determine the status and risks of the key program segments. Finally, we observed senior-level management review meetings to obtain information on the status of the NPOESS program.

To identify how much notice the program office would need if agency sponsors outside the program choose to restore the eliminated or degraded sensors to the NPOESS program, we reviewed the restoration requirements in the program's Nunn-McCurdy certification decision memo and documentation related to the program's planning efforts. We also

interviewed senior officials in the NPOESS program office and the Program Executive Office to obtain information on program plans related to sensor restoration, the historical basis for these time frames, and the flexibility of these time frames for different sensor technologies.

To assess agency plans for obtaining the environmental data originally planned to be collected by NPOESS sensors but then eliminated under the restructuring, we reviewed reports and briefings produced by NASA, NOAA, DOD, and the National Research Council on the impact of eliminated sensors and priorities for restoring them. We also interviewed agency officials from NASA, NOAA, and DOD, and sought and received answers to questions from the Office of Science and Technology Policy regarding decisions to restore two sensors to the NPOESS Preparatory Project (NPP) satellite.

We primarily performed our work at the NPOESS Integrated Program Office and at DOD, NASA, and NOAA offices in the Washington, D.C., metropolitan area. In addition, we conducted work at NOAA offices in Suitland, Maryland, and at the Air Force Weather Agency in Omaha, Nebraska, because these sites will be the first two sites to host the NPOESS data processing system and to receive NPP data. We also conducted audit work at the Boulder, Colorado, facility of the contractor that is to integrate sensors on the NPP satellite. We conducted this performance audit from June 2007 to April 2008 in accordance with generally accepted government auditing standards.

Appendix II: Status of Key Acquisition Documents

Table 11 identifies the key NPOESS acquisition documents as well as their original and revised due dates. Original due dates were specified in the June 2006 restructuring decision memo. The revised due dates were specified in an addendum to that memo, dated June 2007. Documents that are in bold are overdue.

Table 11: Status of NPOESS Acquisition Documents

Acquisition document	Original due date	Revised due date	Status
Alternative Management Plan	June 2007	September 1, 2007	Completed
Award Fee Plan/ Fee Management Plan	**Unspecified**	**October 1, 2007**	**Not completed**
Acquisition Program Baseline	**September 1, 2006**	**December 1, 2007**	**Not completed**
Acquisition Strategy Report	**September 1, 2006**	**September 1, 2007**	**Not completed**
Test and Evaluation Master Plan	**September 1, 2006**	**March 1, 2008**	**Not completed**
System Engineering Plan	September 1, 2006	September 1, 2007	Completed
Two-Orbit Plan	**November 15, 2006**	**October 1, 2007**	**Not completed**
Human Capital Management Plan (to fill vacancies in the Integrated Program Office)	August 4, 2006	September 1, 2007	Completed
Logistics Support Plan	September 2006	September 1, 2007	Completed
Diminishing Manufacturing Sources/Parts Obsolescence Plan	September 2006	September 1, 2007	Completed
Tri-agency Memorandum of Agreement	**August 4, 2006**	**September 1, 2007**	**Not completed**
Integrated Master Plan	April 2007	September 1, 2007	Completed
Quarterly Integrated Baseline Review	September 2006	September 1, 2007	Completed

Source: GAO analysis of DOD and NPOESS program office data.

Appendix III: Comments from the Department of Commerce

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

April 3, 2008

Mr. David A. Powner
Director
Information Technology
Management Issues
U.S. Government Accountability Office
441 G Street, NW
Washington, D.C. 20548

Dear Mr. Powner:

Thank you for the opportunity to review and comment on the Government Accountability Office's draft report entitled *Environmental Satellites: Polar-orbiting Satellite Acquisition Faces Delays; Decisions Needed on Whether and How to Ensure Climate Data Continuity* (GAO-08-518). On behalf of the Department of Commerce, I enclose the National Oceanic and Atmospheric Administration's comments on the draft report.

Sincerely,

Carlos M. Gutierrez

Enclosure

Department of Commerce
Comments on the Draft GAO Report Entitled
"Environmental Satellites: Polar-orbiting Satellite Acquisition Faces Delays; Decisions Needed on Whether and How to Ensure Climate Data Continuity"
(GAO-08-518/April 2008)

General Comments

The Department of Commerce (DOC) appreciates the opportunity to review this report on the National Polar-orbiting Environmental Satellite System (NPOESS) program. The Government Accountability Office (GAO) makes two recommendations, which it anticipates will bring closure to efforts underway. Both recommendations are directed to DOC, as well as to the Department of Defense (DoD) and the National Aeronautics and Space Administration (NASA). Overall, the report was fair and balanced and highlighted actions that are already underway for the program. DOC is committed to ensuring the successful execution of the NPOESS program.

NOAA Response to GAO Recommendations

Recommendation 1: "In order to bring closure to efforts that have been underway for years, we are making recommendations to the Secretaries of Commerce and Defense and to the Administrator of NASA to establish plans on whether and how to restore the climate and space sensors removed from the NPOESS program by June 2009, in cases where the sensors are warranted and justified."

NOAA Response: NOAA concurs with the recommendation and continues to work with NASA, the Office of Science and Technology Policy (OSTP), and the Office of Management and Budget (OMB) on long-term plans to restore the climate sensors de-manifested from the NPOESS program. This supplements coordination with DoD and NASA as part of the tri-agency NPOESS Executive Committee. The FY 2009 President's Budget demonstrates this commitment by advancing plans already underway to re-manifest two key climate sensors through at least FY 2013. NOAA continues to work to finalize plans for restoring additional sensors, in coordination with NASA, OSTP, OMB, and DoD to address the nation's long-term need for continuity of these critical climate measurements.

Recommendation 2: "In addition, we are reemphasizing our prior recommendation that the appropriate NASA, NOAA, and DOD executives immediately finalize key acquisition documents."

NOAA Response: NOAA concurs with this recommendation. Executive attention and prompt resolution of the issues surrounding the documentation required by the Acquisition Decision Memorandum is required. All acquisition decision memorandum documents are proceeding through coordination at DOC, DoD and NASA. DoD and NASA executives need to weigh in to resolve issues at or immediately below their level.

1

Appendix IV: Comments from the Department of Defense

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
6000 DEFENSE PENTAGON
WASHINGTON, DC 20301-6000

NETWORKS AND
INFORMATION INTEGRATION

APR 0 1 2008

Mr. David A. Powner
Director, Information Technology and Management Issues
U.S. Government Accountability Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Powner,

This is the Department of Defense (DoD) response to the GAO Draft Report, GAO-08-518, "ENVIRONMENTAL SATELLITES: Polar-orbiting Satellite Acquisition Faces Delays; Decisions Needed on Whether and How to Ensure Climate Data Continuity," dated March 6, 2008 (GAO Code 310848).

The DoD acknowledges receipt of this draft report and concurs with GAO recommendations (attached).

Dr. Ronald C. Jost
Deputy Assistant Secretary of Defense
(C3, Space and Spectrum)

Enclosure(s):
As stated

GAO DRAFT REPORT DATED MARCH 6, 2008
GAO-08-518 (GAO CODE 310848)

"ENVIRONMENTAL SATELLITES: POLAR-ORBITING SATELLITE ACQUISITION FACES DELAYS; DECISIONS NEEDED ON WHETHER AND HOW TO ENSURE CLIMATE DATA CONTINUITY"

DEPARTMENT OF DEFENSE COMMENTS
TO THE GAO RECOMMENDATIONS

GENERAL COMMENTS: The report recognizes the positive effects of the restructured management for the program and also recognizes the significant work ahead on the program. The draft GAO findings are technically and programmatically consistent with the current NPOESS program.

RECOMMENDATION 1: The GAO recommends that the Secretary of Defense establish plans on whether and how to restore the climate and space sensors removed from the National Polar-orbiting Operational Environmental Satellite System program by June 2009, in cases where the sensors are warranted and justified. (Page 43/GAO Draft Report)

DOD RESPONSE: Concur.

RECOMMENDATION 2: In addition, the GAO is reemphasizing a prior recommendation that the appropriate NASA, NOAA, and DoD executives immediately finalize key acquisition documents. (Page 43/GAO Draft Report)

DOD RESPONSE: Concur. The System Engineering Plan was approved on 8 Nov 07.

Attachment

Appendix V: Comments from the National Aeronautics and Space Administration

National Aeronautics and Space Administration
Headquarters
Washington, DC 20546-0001

Reply to Attn of: SMD/Earth Science Division

Mr. David A. Powner
Director
Information Technology Management Issues
Government Accountability Office
Washington, DC 20548

Dear Mr. Powner:

Thank you for the opportunity to review your draft report entitled "Polar-orbiting Satellite Acquisition Faces Delays: Decisions Needed on Whether and How to Ensure Climate Data Continuity," (GAO-08-518) specific to the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program. The draft report contains two recommendations applicable to NASA and we concur with both of these recommendations.

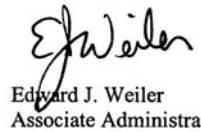
We agree with the importance of signing the programmatic documentation across all agencies. As documented in previous reports, the difficulty of gaining consensus across all three NPOESS agencies has delayed the signature on the remaining documents. We are committed to moving these documents through the signature cycle as quickly as possible once all of the issues and concerns are resolved.

With respect to a long-term plan for flying the demanifested NPOESS sensors, NASA has taken significant steps to fly the Ozone Mapping and Profiling Suite (OMPS) Limb sensor and the Clouds and the Earth's Radiant Energy System (CERES) sensors on the NPOESS Preparatory Project (NPP) in order to mitigate the possibility of near term data gaps. This effort has afforded us the opportunity consider many options for flight of the remaining sensors for the long term. We have been working closely with the National Oceanic and Atmospheric Administration (NOAA) on the details of our long-term plans and will keep you informed of our progress.

We will continue to work with NOAA and DoD toward the success of the NPP and NPOESS programs. Thank you again for the opportunity to review this draft report, and we are looking forward to your final report to Congress.

If you have any questions or require additional information, please contact Andrew Carson on (202) 358-1702.

Sincerely,



Edward J. Weiler
Associate Administrator for
Science Mission Directorate

cc:
Science Mission Directorate/C.Gay

- T. May
- M. Freilich
- A. Carson
- M. Luther
- S. Volz

Appendix VI: GAO Contact and Staff Acknowledgments

GAO Contact

David A. Powner, (202) 512-9286, or pownerd@gao.gov

Staff Acknowledgments

In addition to the contact named above, Colleen Phillips (Assistant Director), Carol Cha, Neil Doherty, Nancy Glover, Kathleen S. Lovett, and Kelly Shaw made key contributions to this report.

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